

REMARKS

The Applicants sincerely appreciate the thorough examination of the present application as evidenced by the Office Action of December 1, 2004. In response, the Applicants have amended Independent Claims 1, 12, 24, 34, 45, and 55 to address minor objections relating thereto; and canceled Claims 23, 44, and 66.

The Applicants will show in the following remarks that all pending claims are patentable over the cited art. For at least the reasons discussed below, the Applicants respectfully submit that all claims are in condition for allowance, and a Notice of Allowance is, thus, respectfully requested in due course.

All Rejections Under 35 U.S.C. Sec. 112 Have Been Overcome

Claims 1-66 have been rejected under 35 U.S.C. Sec. 112, second paragraph, as being indefinite. More particularly, the Office Action states that:

The claims should indicate clearly that the interferometric image is at the image plane (photosensitive layer) and that the reflective surface is not holographic.

It should be made clear if the process embraces mere interferometrically measurement/testing of the surface or requires prior knowledge/design of the interference pattern projected (i.e. a particular design is desired).

In response, the Applicants respectfully submit that the claims meet all requirements of 35 U.S.C. Sec. 112. Claim 1, for example, recites "A method for patterning a layer on a substrate with a desired image...." Moreover, Claim 1 further recites that " the reflector surface includes variation in a property thereof providing information that corresponds to the desired image;" that " portions of the coherent beam of electrons projected without reflecting off the reflector surface interfere to provide a holographic projection of the desired image;" and that " the holographic projection of the desired image is projected onto the layer to thereby pattern the layer with the desired image."

Accordingly, Claim 1 is clear that a layer is patterned with "a desired image" using a "holographic projection of the desired image" that is projected onto the layer. In addition, Claim 1 has been amended to clarify that the reflective surface includes variation in a property thereof providing information that corresponds to the desired image. Moreover,

similar recitations are included in Independent Claims 12, 24, 34, 45, and 55. Accordingly, all rejections under 35, U.S.C. Sec. 112 have been overcome.

As discussed above, each of the independent claims has been amended to provide the clarification that "the reflector surface includes variation in a property thereof providing information that corresponds to the desired image." The Applicants note that this amendment has been made to provide clarification with respect to the rejections under 35 U.S.C. Sec. 112. This amendment, however, does not affect the scope of the claims. Moreover, the Applicants note that support for this amendment is provided, for example, in the Application as originally filed at page 10, lines 12-32.

All Objections To Claims 23, 44, And 66 Have Been Overcome

Claims 23, 44, and 66 have been objected to under 37 C.F.R. 1.75(c) as being of improper dependent form for failing to further limit the subject matter of a previous claim. In response, the Applicants have canceled Claims 23, 44, and 66. Accordingly, all objections under 37 C.F.R. 1.75(c) have been overcome.

All Double Patenting Rejections Have Been Overcome

Claims 1-66 have been rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-28 of U.S. Patent No. 6,730,443. The Office Action further states that:

A timely filed terminal disclaimer ... may be used to overcome an actual ... rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application.

In order to advance prosecution of this application, the Applicants submit herewith a terminal disclaimer in compliance with 37 C.F.R. 1.321. Accordingly, all double patenting rejections have been overcome. The filing of this Terminal Disclaimer shall not be construed as an admission that the claims are unpatentable under the judicially created doctrine of obviousness-type double patenting or are obvious under 35 USC §103.

Claims 8, 20, 22, 30-32, 41, 43, 51-53, 63, And 65 Are Patentable As No Prior Art Rejections Have Been Applied To These Claims

Claims 8, 20, 22, 30-32, 41, 43, 51-53, 63, and 65 are patentable because all rejections under 35 U.S.C. Sec. 112 and all double patenting rejections have been overcome and because no art rejections have been applied to these claims. Accordingly, the Applicants respectfully request allowance of Claims 8, 20, 22, 30-32, 41, 43, 51-53, 63, and 65. These claims have not been rewritten in independent form because the Applicants will show in the following remarks that Independent Claims 1, 12, 24, 34, 45, and 55 are patentable over the cited art.

**Claims 12, 13, 18, 21, 29, 34, 39, 40, 42, 55,
61, 62, And 64 Are Patentable Over Hochberg**

Claims 12, 13, 18, 21, 29, 34, 39, 40, 42, 55, 61, 62, And 64 have been rejected under 35 U.S.C. Sec. 102(b) as being anticipated by U.S. Patent No. 4,788,116 to Hochberg (Hochberg). The Applicants respectfully submit, however, that these claims are patentable over Hochberg for at least the reasons discussed below.

Claim 12, for example, recites a method for patterning a layer on a substrate with a desired image. In particular, Claim 12 recites:

- projecting coherent radiation along divergent paths toward a reflector surface so that the coherent radiation is reflected off the reflector surface wherein the reflector surface includes variation in a property thereof providing information that corresponds to the desired image;

- projecting a portion of the coherent radiation to the layer without reflecting off the reflector surface; and

- maintaining the substrate including the layer in the path of the reflected radiation and in the path of the portion of the coherent radiation projected without reflecting off the reflector surface so that the reflected radiation and the coherent radiation projected without reflecting off the reflector surface interfere to provide a holographic projection of the desired image and so that the holographic projection of the desired image is projected onto the layer to thereby pattern the layer with the desired image.

In Hochberg, Figures 3A and 3B illustrate a photosensitized plate 70 and a Lloyd's mirror arrangement 62. More particularly:

The Lloyd's mirror arrangement is one method by which the gratings can be recorded. Such an arrangement creates interference between two monochromatic beams derived from the same laser. These interference patterns consist of very spatial

frequency "fringes", bands of light and dark. These illumination variations will ultimately be converted into periodic surface relief patterns which will exhibit diffraction effects. See FIGS. 3A and 3B.

Proper chemical development results in a WGC master plate 70 containing the three diffraction gratings as a surface relief pattern in the photoresist.

Hochberg, col. 4, lines 38-49.

The Lloyd's mirror arrangement 62, however, does not include information that corresponds to a desired image. Stated in other words, Hochberg discusses a "mirror" as opposed to a reflector surface including variation in a property thereof providing information that corresponds to a desired image.

Accordingly, the Applicants respectfully submit that Claim 12 is patentable over Hochberg. The Applicants further submit that Claims 34 and 55 are patentable over Hochberg for reasons similar to those discussed above with respect to Claim 12. In addition, Dependent Claims 13, 18, 21, 39, 40, 42, 61, 62, and 64 are patentable at least as per the patentability of Claims 12, 34, and 55 from which they depend.

Claims 1-2, 5-7, 9-13, 16-17, 19, 24, 27-29, 33-34, 37-38, 40, 45, 48-50, 54-55, 58-60, And 62, Are Patentable Over The Combination Of Joy And Spencer

Claims 1-2, 5-7, 9-13, 16-17, 19, 24, 27-29, 33-34, 37-38, 40, 45, 48-50, 54-55, 58-60, and 62 have been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Joy *et al.* "Advanced SEM Imaging" (hereinafter "Joy") in view of Spence *et al.* "Low Energy Point Reflection Electron Microscopy" (hereinafter "Spence"). These Claims are patentable over the combination of Joy and Spence for at least the reasons discussed below.

Claim 1, for example, recites "A method for patterning a layer on a substrate with a desired image." (Underline added.) The method of Claim 1 includes:

projecting a coherent beam of electrons toward a reflector surface so that a portion of the coherent beam of electrons is reflected off the reflector surface wherein the reflector surface includes variation in a property thereof providing information that corresponds to the desired image;

projecting a portion of the coherent beam of electrons to the layer without reflecting off the reflector surface; and

maintaining the substrate including the layer in the path of the reflected radiation and in the path of the portion of the coherent beam of electrons projected

without reflecting off the reflector surface so that the reflected portions of the coherent beam of electrons and portions of the coherent beam of electrons projected without reflecting off the reflector surface interfere to provide a holographic projection of the desired image and so that the holographic projection of the desired image is projected onto the layer to thereby pattern the layer with the desired image. (Underline added.)

In contrast to the patterning method of Claim 1, both Joy and Spence relate to microscopes as evidenced for example by the titles: "Advanced SEM Imaging" (where SEM is an acronym for Scanning Electron Microscope); and "Low Energy Point Reflection Electron Microscopy." (Underline added.) In particular, Figure 8 of Joy is a "Schematic layout of an advanced imaging system..." (Joy, page 659.) In Spence, Figure 1 illustrates a "Point projection microscope" (Spence, page 578); and Figure 3 illustrates "Principle of point reflection electron microscope" (Spence, page 580); and Figure 7 illustrates "Path differences for a phase shift at a step" (Spence, page 582). More generally, Spence reports "the first preliminary results from a new low voltage electron microscope...." (Spence, page 577.)

Accepting the characterization of the combination of Joy and Spence provided in the Office Action, for the sake or argument, capturing an image and/or measuring diffraction patterns fails to disclose or suggest patterning as recited in Claim 1. In particular, the Office Action states that:

It would have been obvious ... to modify the process of Joy ...by using a microchannel plate detection means such as that taught by Spence ... with a reasonable expectation of capturing/resolving the desired diffraction image based upon the similarity of layout for the electron emitter tip and the scattering/reflection surface and the disclosure of measuring diffraction patterns in Spence....

Office Action, page 4. (Underline added.) Even accepting this characterization for the sake of argument, measuring diffraction patterns fails to teach or suggest patterning as recited in Claim 1.

As set forth in the Manual of Patent Examining Procedure (MPEP), three basic criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art

references when combined must teach or suggest all the claim limitations. Moreover, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *See*, MPEP, Sec. 2143.

As discussed above, neither Joy or Spence, taken alone or in combination, teaches or suggests a method for patterning a layer on a substrate with a desired image wherein a reflector surface includes variation in a property thereof providing information that corresponds to the desired image, and/or wherein a holographic projection of the desired image is projected onto the layer to thereby pattern the layer with the desired image. Accordingly, the prior art references do not teach or suggest all the claim limitations. Moreover, both Joy and Spence teach away from the recitations of Claim 1 because both Joy and Spence relate to microscopy. Accordingly, there is no motivation to combine Joy and Spence to somehow provide the method of Claim 1.

For at least the reasons discussed above, the Applicants respectfully submit that Claim 1 is patentable over the combination of Joy and Spence. The Applicants further submit that Independent Claims 12, 24, 34, 45, and 55 are patentable over Joy and Spence for reasons similar to those discussed above with regard to Claim 1. In addition, Dependent Claims 2-11, 13-23, 25-33, 35-44, 46-54, and 56-66 are patentable over Joy and Spence at least as per the patentability of Claims 1, 12, 24, 34, 45, and 55 from which they depend.

**Claims 1-7, 9-19, 24-29, 33-38, 40, 45-50, 54-60, And 62
Are Patentable Over The Combination Of Joy, Elliott, and Tetsuo**

Claims 1-7, 9-19, 24-29, 33-38, 40, 45-50, 54-60, and 62 have been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Joy in view of Elliott "Integrated Circuit Manufacturing Technology" (hereinafter "Elliott") or Tetsuo *et al.* Japanese Publication No. 11-329944 (hereinafter "Tetsuo"). The Applicants respectfully submit that all claims are patentable over the combination of Joy, Elliott, and Tetsuo for at least the reasons discussed below.

Claim 1, for example, recites "A method for patterning a layer on a substrate with a desired image." The method of Claim 1 includes:

projecting a coherent beam of electrons toward a reflector surface so that a portion of the coherent beam of electrons is reflected off the reflector surface wherein the reflector surface includes variation in a property thereof providing information that corresponds to the desired image;

projecting a portion of the coherent beam of electrons to the layer without reflecting off the reflector surface; and

maintaining the substrate including the layer in the path of the reflected radiation and in the path of the portion of the coherent beam of electrons projected without reflecting off the reflector surface so that the reflected portions of the coherent beam of electrons and portions of the coherent beam of electrons projected without reflecting off the reflector surface interfere to provide a holographic projection of the desired image and so that the holographic projection of the desired image is projected onto the layer to thereby pattern the layer with the desired image. (Underline added.)

As discussed above, Joy discusses scanning electron microscope imaging as opposed to patterning as recited in Claim 1. Elliott and/or Tetsuo fail to provide the missing teachings. More particularly, Elliott discusses resists "formulated for use with e-beam exposure" (Elliott, page 77), and Tetsuo discusses a structure in Figure 3 including Si substrate 31, Si oxide film 32, polysilane 33, and chemistry amplification type positive resist 34, (Tetsuo, translation, page 3, paragraph 25) "to form a highly precise resist pattern, without a charge up arising" (Tetsuo, translation, page 3, paragraph 30).

With respect to Tetsuo, the Office Action states that Tetsuo "teaches the use of silicon layers, which are able to be selectively oxidized as image detectors for electron beams." The Applicants respectfully disagree. In particular, Tetsuo discusses electric charge beam alignment and exposure. (See, Tetsuo, translation, page 3, paragraph 30.) More particularly:

By irradiating light 10 simultaneously with electron beam exposure, polysilane 33 shows conductivity and the electron 41 caught in the sample 2 moves through a ground 7. Therefore, it becomes possible to form a highly precise resist pattern, without a charge up arising.

Tetsuo, translation, page 3, paragraph 30. As discussed in the Abstract:

The charged beam aligner comprises an electron gun 12 projecting an electron beam 15 toward a sample 2 where a substance exhibiting photoconductivity with light of a specified wavelength is formed on the upper or lower layer of resist....

(Tetsuo, Abstract.) Accordingly, the Applicants respectfully submit that the translation of Tetsuo fails to teach or suggest image detectors for electron beams. Similarly, Elliott

discusses resists "formulated for use with e-beam exposure" (see, Elliott, page 77) as opposed to photoresists for use as detection means.

Nothing in any of Joy, Elliot, and/or Tetsou, taken alone or in combination, teaches or suggests patterning as recited in Claim 1 where a holographic projection of a desired image is projected onto a layer to thereby pattern the layer with the desired image. In contrast, Joy discusses scanning electron microscopy and Elliott and Tetsou discuss electron beam resists without mention of holographic projection.

As discussed in Section 2143 of the Manual for Patent Examining Procedure, three basic criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second there must be a reasonable expectation of success. Finally, the prior art references when combined must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. MPEP, Sec. 2143.

The Applicants respectfully submit that there is no suggestion or motivation in the references or in the knowledge generally available to one of ordinary skill in the art to somehow modify the scanning electron microscope of Joy to include a resist of either Elliott and/or Tetsuo. More particularly, there is no suggestion or motivation to somehow use a resist of either Elliott and/or Tetsuo together with or in place of a backscattered electron detector of Joy. Moreover, if a resist of either Elliott and/or Tetsuo were used together with or in place of a backscattered electron detector of a scanning electron microscope of Joy, the Applicants respectfully submit that such a combination would have no expectation of success. Instead, the use of a resist in the scanning electron microscope of Joy would reasonably be expected to result in failure of the scanning electron microscope as opposed to somehow patterning a layer with a desired image.

The Applicants note that the Office Action states that: "it would have been obvious ... to modify the process of Joy ...using photoresists or oxidizable silicon layers as detection means as taught by Elliot ... or Tetsou ... with a reasonable expectation of

capturing/resolving the desired diffraction image based upon the disclosure of the use of these means in the art for detection of electrons." As discussed above, the use of a photoresist from Tetsou and/or Elliott in the scanning electron microscope of Joy could not be reasonably expected to succeed.

For at least these reasons, the Applicants respectfully submit that Claim 1 is patentable over the combination of Joy, Elliott, and Tetsou. The Applicants further submit that Independent Claims 12, 24, 34, 45, and 55 are also patentable over the combination of Joy, Elliott, and Tetsou for reasons similar to those discussed above with regard to Claim 1. In addition, Dependent Claims 2-11, 13-23, 25-33, 35-44, 46-54, and 56-65 are patentable over the combination of Joy, Elliot, and Tetsou at least as per the patentability of Claims 1, 12, 24, 34, 45, and 55 from which they depend.

Claims 3, 4, 14, 15, 25, 26, 35, 36, 46, 47, 56, and 57 Are Independently Patentable

Claims 3, 4, 14, 15, 25, 26, 35, 36, 46, 47, 56, and 57 are patentable over Joy, Spence, Elliot, and/or Tetsuo for the reasons discussed above. Claims 3, 4, 14, 15, 25, 26, 35, 36, 46, 47, 56, and 57 are also patentable for at least the additional reasons discussed below.

Claim 3, for example, recites that "the layer comprises an oxide layer that is activated on exposure to portions of the holographic projection of the desired image having sufficient intensity, so that the activated portions of the oxide layer can be selectively removed, maintained, or modified." Similar recitations are included in Claims 14, 25, 35, 46, and 56. Claim 4, for example, recites that "the layer comprises a silicon layer that is activated on exposure to portions of the holographic projection of the desired image having sufficient intensity, so that activated portions of the silicon layer can be selectively oxidized or modified." Similar recitations are included in Claims 15, 26, 36, 47, and 57.

The Applicants respectively submit that Joy, Spencer, Elliot, and/or Tetsuo, taken alone or in combination fails to teach or suggest a silicon layer or a silicon oxide layer that is activated on exposure to portions of a holographic projection having sufficient intensity so that activated portions can be selectively removed, maintained, modified, and/or oxidized. As discussed above, Joy relates to microscope imaging as opposed to patterning; Spencer

discusses a positive-working photoresist (see, Spencer, col. 4, line 14); and Elliott and Tetsuo discuss patterning of electron beam resists. None of the cited references, however, discloses or suggests oxide or silicon layers that are activated on exposure to portions of a holographic projection.

Accordingly, Joy, Spencer, Elliott, and/or Tetsuo fails to disclose or suggest the recitations of Claims 3 and 4, and Claims 3 and 4 are thus independently patentable. In addition, Claims 14, 15, 25, 26, 35, 36, 46, 47, 56, and 57 are also independently patentable for reasons similar to those discussed above with regard to Claims 3 and 4.

Dependent Claims 9, 21, 31, 42, 52, and 64 Are Independently Patentable

Dependent Claims 9, 21, 31, 42, 52, and 64 are patentable over the combination of Hochberg, Joy, Spence, Elliot, and/or Tetsuo for the reasons discussed above. Dependent Claims 9, 21, 31, 42, 52, and 64 are also patentable for at least the additional reasons discussed blow.

Dependent Claim 9, for example, recites "projecting two beams of coherent radiation toward a reflector surface." The Applicants respectfully submit that none of the cited references teaches or suggests projecting two beams of coherent radiation. Accordingly, the Applicants respectfully submit that Claims 9, 21, 31, 42, 52, and 64 are independently patentable over the cited art.

Dependent Claims 10, 22, 32, 43, 53, And 65 Are Independently Patentable

Dependent Claims 10, 22, 32, 43, 53, And 65 are patentable over the combination of Joy, Spence, Elliot, and/or Tetsuo for the reasons discussed above. Dependent Claims 10, 22, 32, 43, 53, And 65 are also patentable for at least the additional reasons discussed blow.

Dependent Claim 10, for example, recites projecting coherent radiation toward a second reflector surface to provide a second holographic projection of reflected radiation. The Applicants respectfully submit that none of the cited references teaches or suggests a second reflector. Accordingly, the Applicants respectfully submit that Claims 10, 22, 32, 43, 53, And 65 are independently patentable over the cited art.

In re: Daniel J.C. Herr *et al.*
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CONCLUSION

The Applicants sincerely appreciate the Examiner's thorough examination of this application. In response, the Applicants submit that all rejections have been overcome and that all pending claims in the present application are in condition for allowance for at least the reasons discussed above. A Notice of Allowance is thus respectfully requested in due course. The Examiner is encouraged to contact the undersigned attorney by telephone should any additional issues need to be addressed.

Respectfully submitted,

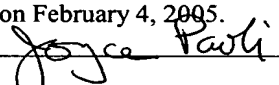


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Joyce Paoli
Date of Signature: February 4, 2005